

**Warfighting and Disruptive Technologies:  
Disguising Innovation**  
*by Captain Terry C. Pierce USN*

**Explaining Navy and Marine Corps  
Disruptive Innovations from 1899 to 2001**

**John F. Kennedy School of Government,  
Harvard Doctoral Thesis 2001**

**Forthcoming book publication:  
Summer 2004  
Williamson Murray, Editor**

# Achieving Major Warfighting Innovations

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## Two Questions:

How can senior military leaders achieve a disruptive innovation when they are heavily engaged around the world and they are managing sustaining innovations?

What have been the external sources of disruptive and sustaining innovations?

# Technological Innovation vs. Doctrinal Innovation

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## Problem of Old Typology

### **Technology vs. Doctrine**

**No unified theory that could explain:**

**How major innovations were adopted and fully exploited first by an entity other than the inventor of the new technology.**

# Different Typologies: Technology-Driven

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- Vincent Davis – *The Politics of Innovation: Patterns in Navy Cases*, 1967
- He describes cases where new technologies were used to help perform existing missions better and not to change them radically.
  - *Introduction of atomic bombs into the U.S. naval strike force.*
  - *Introduction of nuclear propulsion into the U.S. submarine force.*
  - *LT Sims' advocacy of continuous aim gunfire.*

# Different Typologies: Doctrine-Driven

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- Stephen Rosen – *New Ways of Warfighting*, 1991
- He describes cases where old and new technologies were used with new operational procedures to perform a new way of war.
  - *Blitzkrieg*
  - *Carrier Warfare*
  - *Amphibious Warfare*

# Different Typologies:

## Hybrid: Doctrine-Technology Driven

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- Captain Bradd Hayes, USN and CDR Douglas Smith, USN, *Politics of Naval Innovation*, 1994
- They could not determine which theory of innovation -- technology or doctrine -- was more dominant.
  - *Cruise Missiles and the Tomahawk*
  - *Aegis*
- **Conclusions:**
  - *Technology development precedes doctrine development.*
  - *Programs that have the potential to be truly innovative will have a better chance of being fielded if promoted as evolutionary rather than revolutionary systems.*

# Different Typologies:

## Hybrid: Doctrine-Technology Driven

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- Jeffrey Isaacson, Christopher Layne, and John Arquilla, *Predicting Military Innovation*, Rand, 1999
- They describe cases whereby innovation is manifested by new warfighting concepts and/or means of integrating technology.
- New means of integrating technology may or may not include revised doctrine.
  - *Israeli Defense Forces (1948-1982)*
  - *North Vietnamese Army (1965-1970)*

# Old Typology for Defining Technological Innovation

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**Incremental vs. Radical/  
Breakthrough**



# Old Typology for Defining Innovation

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## Problem of Old Typology

- **Why did successful companies that were well managed and investing in new technologies lose market dominance or fail entirely?**
- **Why did successful militaries, such as post World War I France, that were investing in new technologies, such as the Maginot Line, fail to anticipate and effectively counter the German Blitzkrieg?**

# Architectural Innovation

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## Rebecca Henderson and Kim Clark

- **New model explained why insignificant improvements in technology could result in a major new innovation.**
- **Components of technology stayed the same.**
- **Linkages among components changed in novel ways.**

# Architectural Innovation Theory

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- The importance of this theory is that it explains why seemingly insignificant improvements in technology can result in a new way of warfighting.
- Linkage innovation (doctrine) and component (technology) innovation are both difficult.
- This explains why militaries that dominate a new generation of technology often fail to incorporate this technology in a novel doctrine that leads to a new way of war.

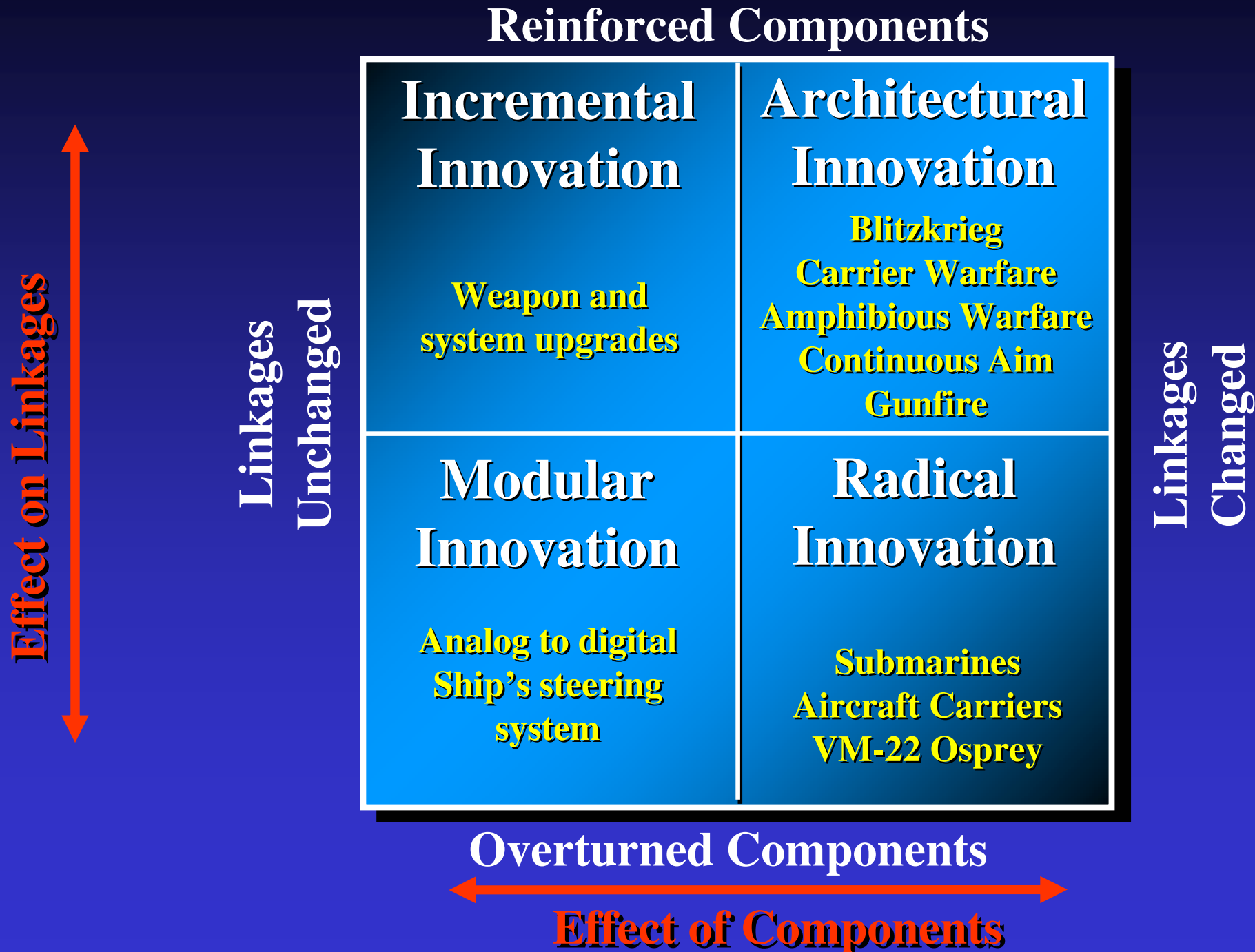
# A New Typology for Defining Innovation

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IMPACT ON LINKAGES BETWEEN  
CORE CONCEPTS AND  
COMPONENTS

		Unchanged	Changed
IMPACT ON <u>CORE</u> CONCEPTS	Reinforced	<i>Incremental Innovation</i>	<i>Architectural Innovation</i>
	Overtured	<i>Modular Innovation</i>	<i>Radical Innovation</i>

# A New Typology for Defining Technology & Doctrine



# Understanding Military Innovations

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## *Two Different Ways:*

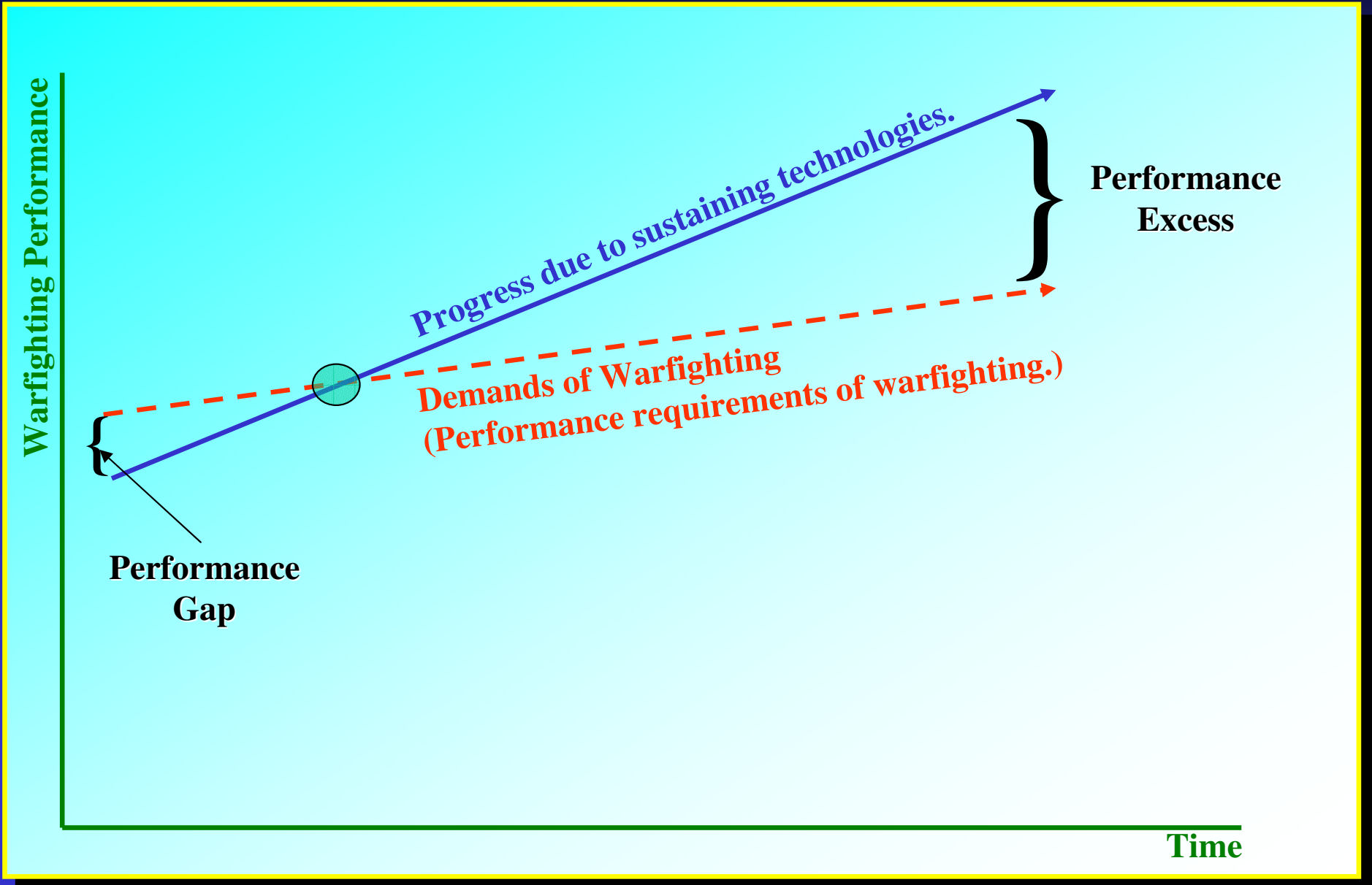
- **In terms of their trajectory performance along paths that warfighters either value or do not value**
- **In terms of their parts – components and linkages**
  - **Components are core technologies or systems that are being either reinforced or overturned**
  - **Linkages are relationships between components that are being either changed or left unchanged**

# Trajectory Performance Sustaining Innovation

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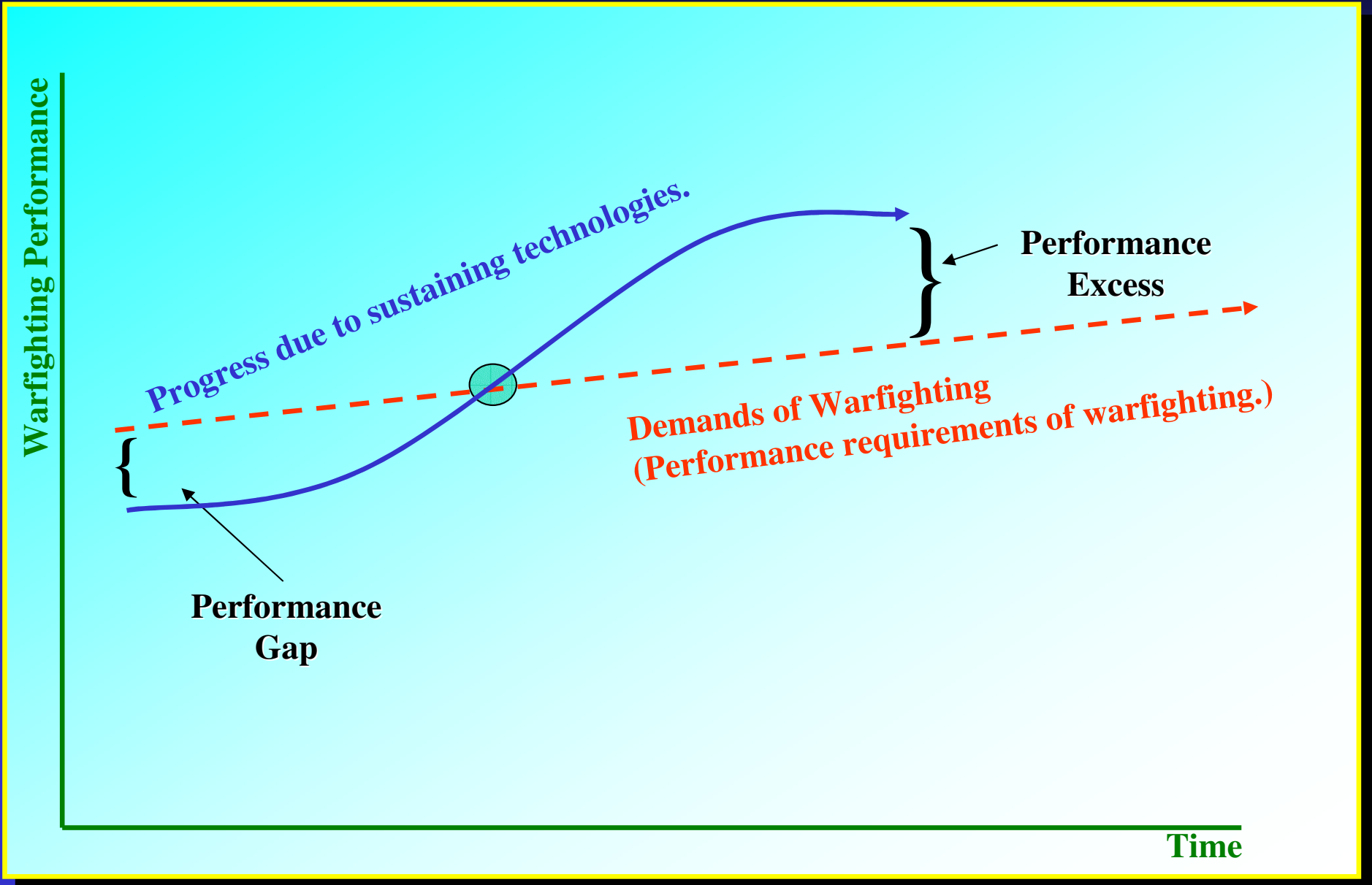
- **Sustaining improves performance of established warfighting methods along an established trajectory that the warfighters currently value.**

# Trajectory Performance Sustaining Innovation





# Trajectory Performance Sustaining Innovation



# Components and Linkages

## Sustaining Innovation

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- **Military leaders focus on creating new radical innovations that can replace existing components, but not on changing the linkages among components.**
  - **For example, the aircraft carrier...a radical technical innovation.**

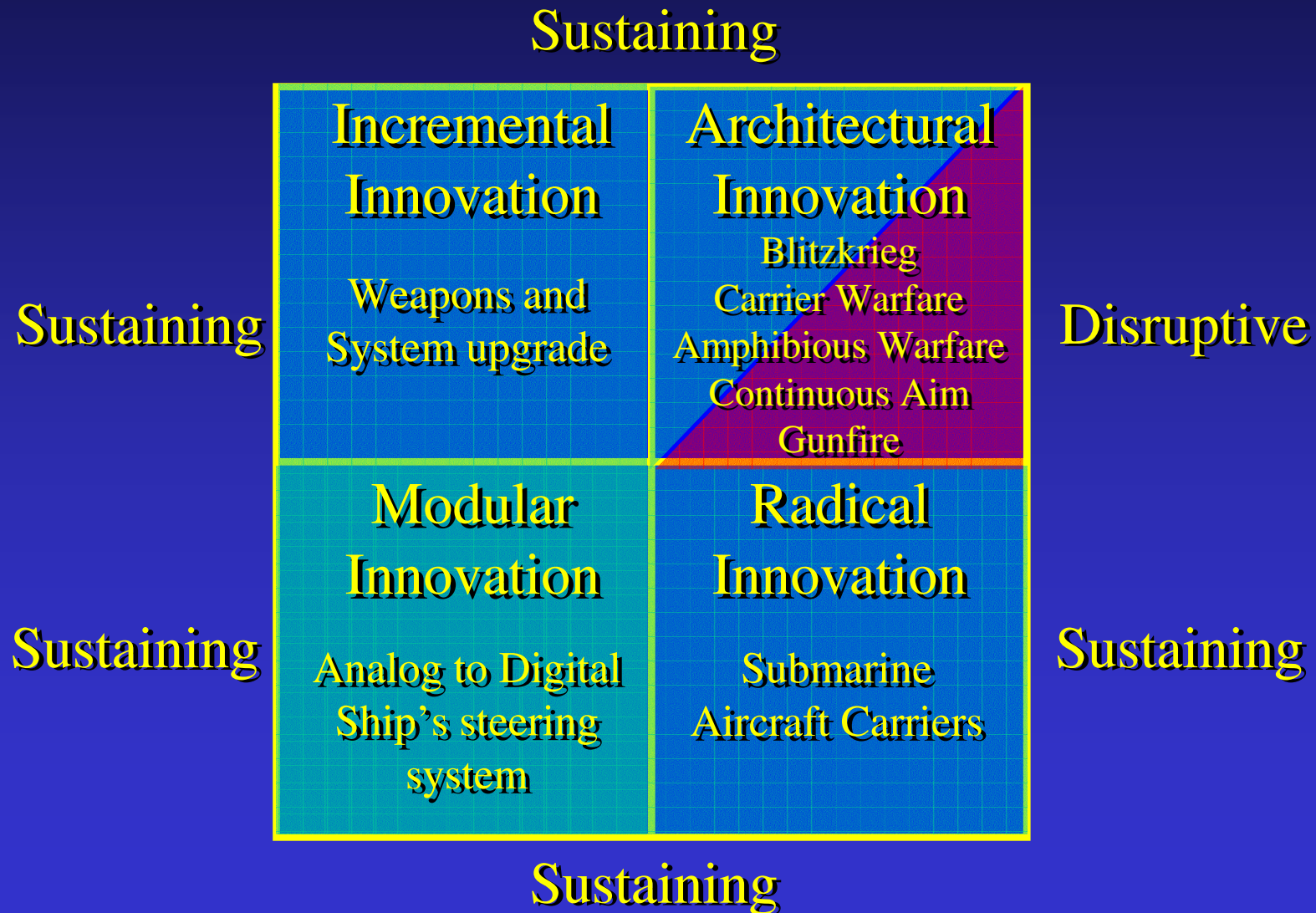
# Components and Linkages Sustaining Innovation

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- **Military leaders focus on maintaining existing linkages among components.**
  - **For example, battleship Admirals describe the role of aircraft carriers as extended “eyes” for battleships**
  - **Aircraft carriers in line of column with battleships**

# Disruptive Architectural Typology for Defining Technology & Doctrine

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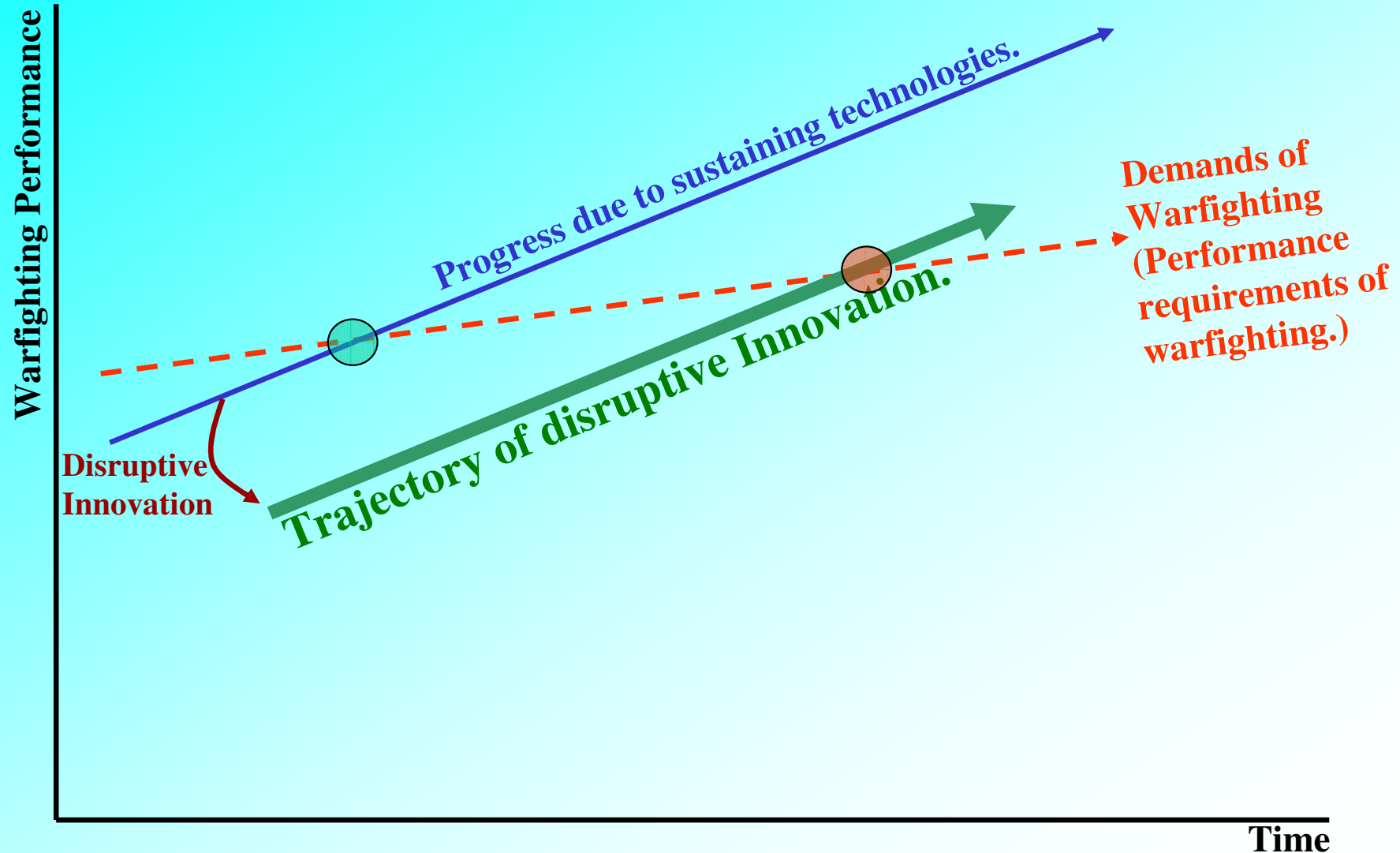


# Trajectory Performance Disruptive Innovation

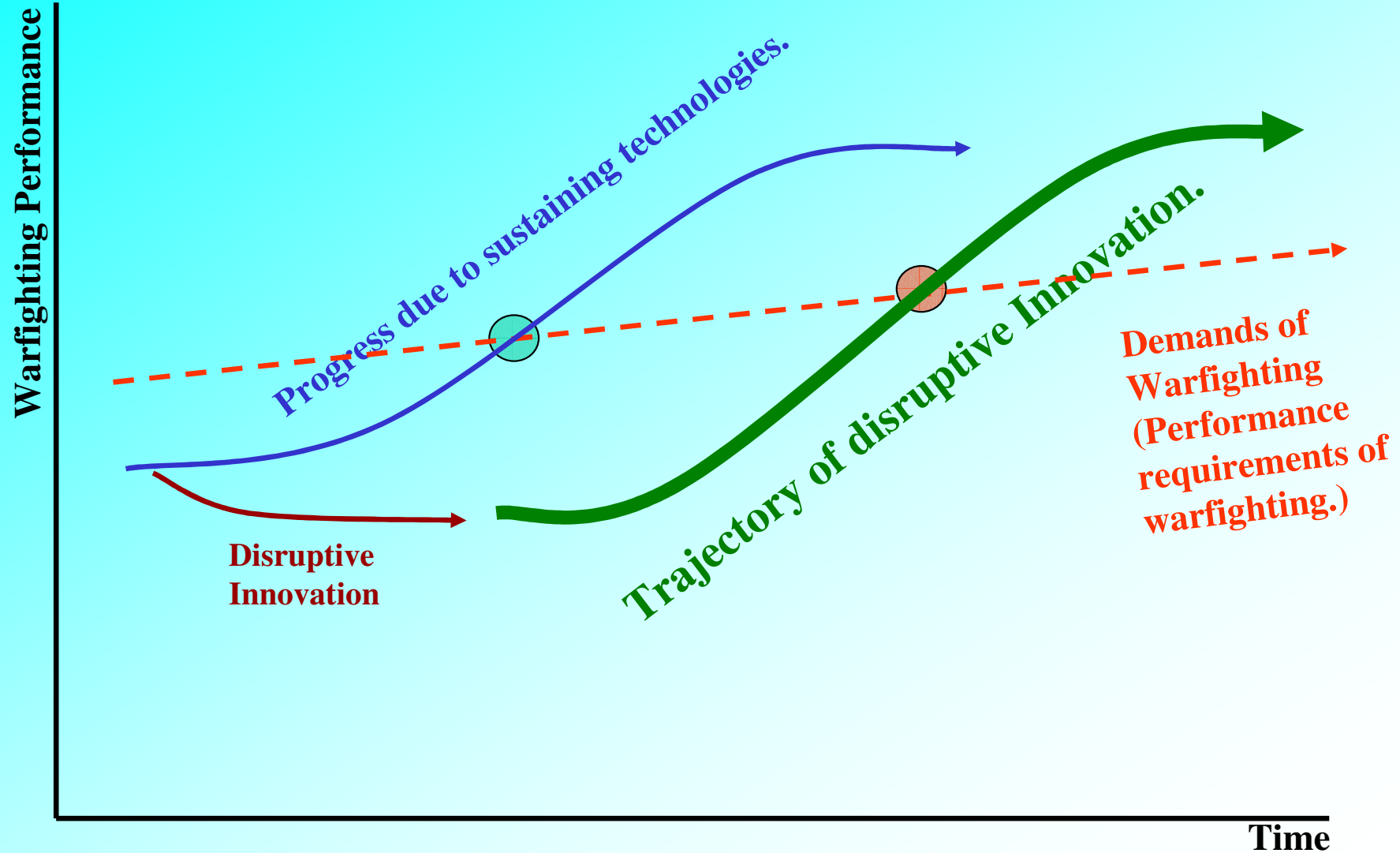
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- **Disruptive innovation improves performance along a trajectory path that traditionally has not been valued.**

# Trajectory Performance Disruptive Innovation



# Trajectory Performance Disruptive Innovation



# Components and Linkages

## Disruptive Innovation

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- **Military leaders focus on changing the way components are linked in novel ways while leaving core design concepts of the technology (and the knowledge underlying them) untouched.**
  - **For example, carrier warfare and blitzkrieg**



# Disruptive Innovation

## Novel Linkages of Existing Components

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- **Carrier Warfare**

- Combined existing core technologies in novel way
  - Carriers, aircraft, arresting/take-off gear

- **Blitzkrieg**

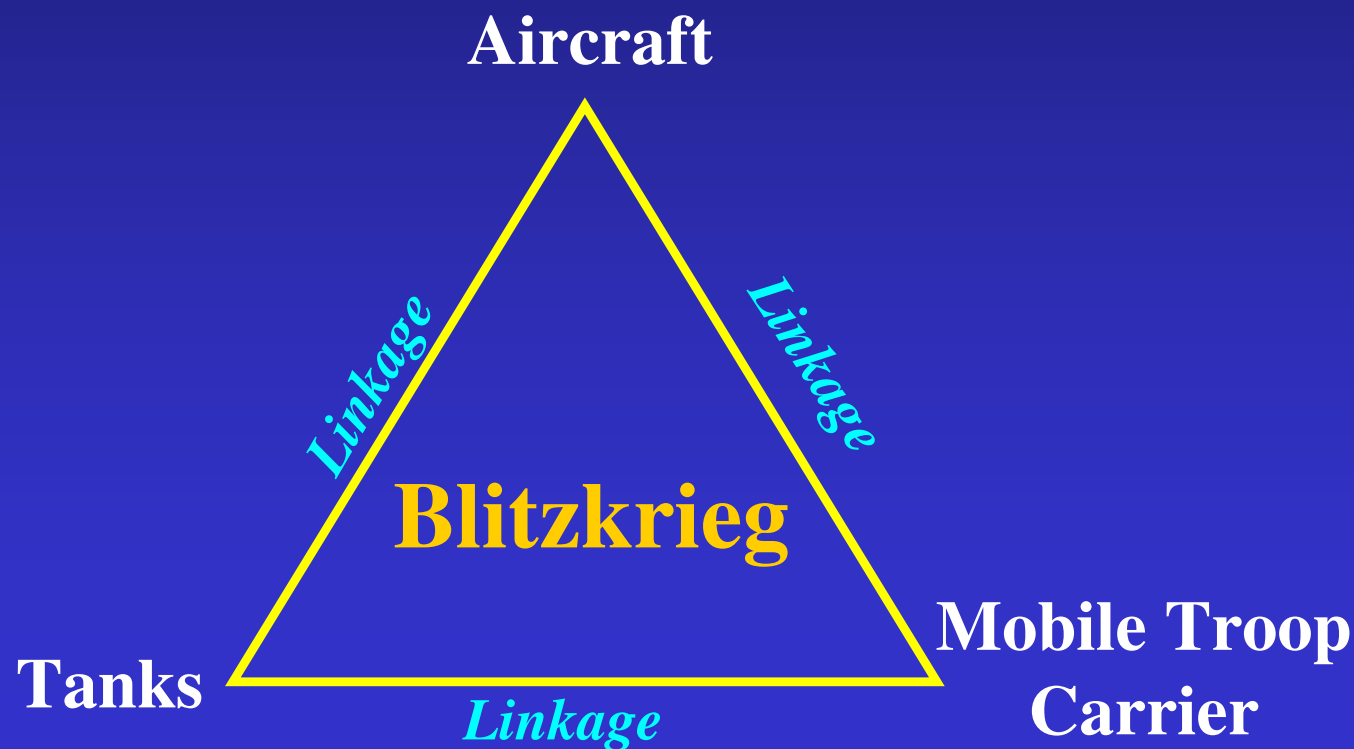
- Combined existing core technologies in novel way
  - Tanks, aircraft, radios, mobile troop carriers

# Disruptive Innovation

## Novel Linkages of Existing Components

### Linear Armored Warfare

*Tanks — Aircraft — Mobile Troop Carrier*



# Sustaining vs. Disruptive Innovation

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- ***Sustaining*** – Sustaining improves performance of established warfighting methods along an established trajectory that the warfighters currently value.
- ***Disruptive*** – Disruptive innovation improves performance along a trajectory path that traditionally has not been valued.

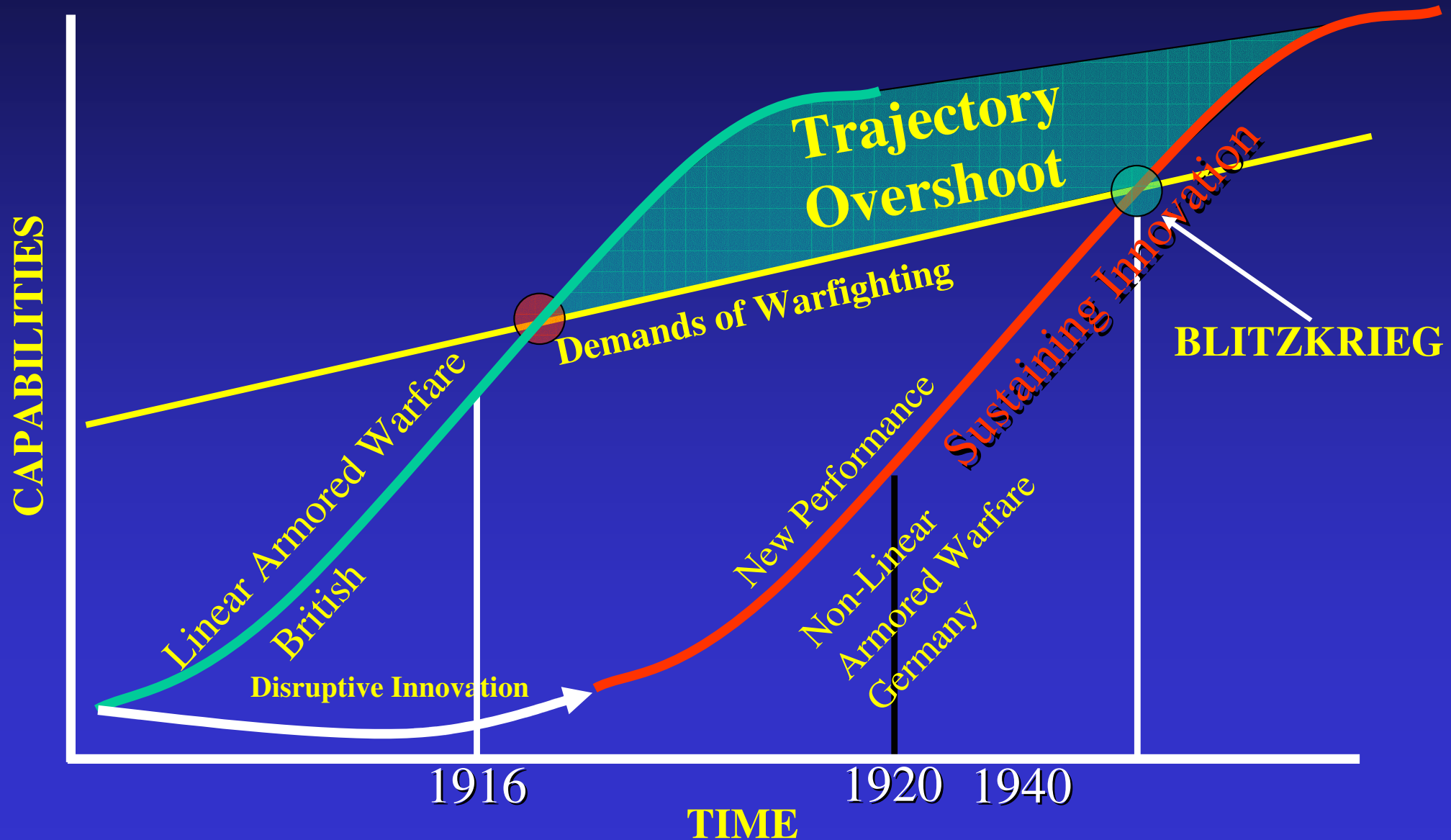
# Sustaining Innovation “Overshoot”

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- Eventually, sustaining innovations will exceed the performance requirements of the traditionally valued way of warfighting (for example, the physical size of Battleships).

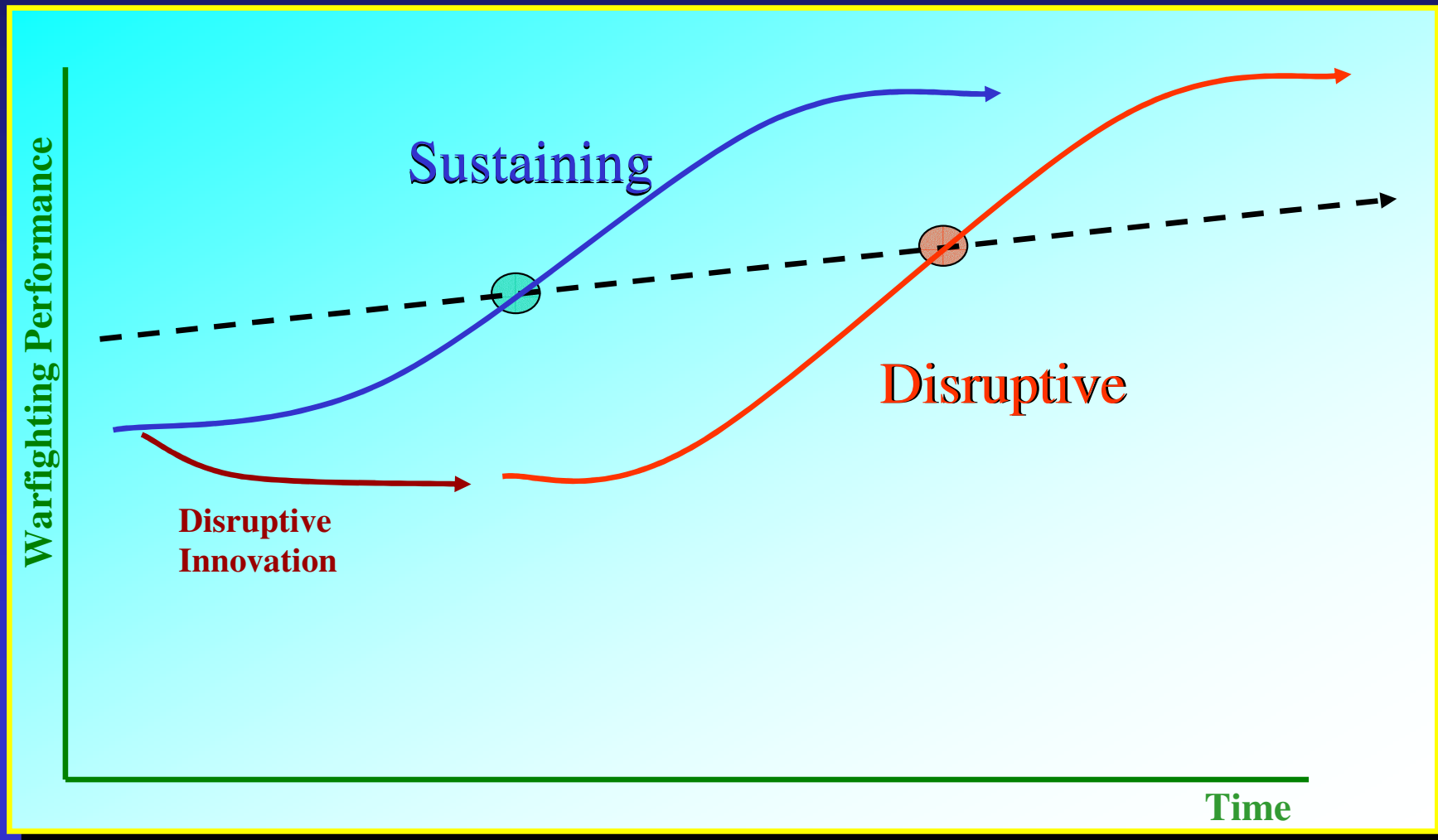
# Sustaining vs. Disruptive Innovation

## Linear vs. Non-Linear Armored Warfare



# Importance of Distinguishing Disruptive and Sustaining

Two different ways to manage.



# Naval Champions Managing Disruptive Innovations

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- **Engine of change: Why and When**
  - Civilian intervention
  - Inter-service rivalry
  - Intra-service rivalry
- **Throttle of change: How**
  - Small group
  - Disguising
  - Zealot
  - Support/Promote junior officers

# Naval Champions Managing Disruptive Innovations

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- **Engine of change: Why and When**
  - **Civilian intervention -- No**
  - **Inter-service rivalry -- Yes**
  - **Intra-service rivalry -- Yes**



# Naval Champions Managing Disruptive Innovations

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- **Throttle of change: How**
  - **Small group -- Yes**
  - **Disguising**
    - **Peacetime -- Yes**
    - **Wartime/Defeat -- No**
  - **Zealot -- No**
  - **Support/Promote junior officers -- Yes**

# Naval Champions Managing Disruptive Innovations

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- **Senior Military Champion establishes Disruptive Innovation Team**
  - Serves as incubator for redefining warfighting tasks
  - Works directly for Senior Military Champion
  - For example, in 1933 USMC Commandant General Fuller established a Disruptive Innovation Group comprised of four USMC Majors and a Navy LT for developing amphibious doctrine

# Naval Champions Managing Disruptive Innovations

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- **Senior Military Champion disguises innovation**
  - **Promotes as sustaining innovation reinforcing current way of fighting**
    - **For example, Admiral Moffett and carrier warfare**
  - **Protect and nurture nascent disruptive innovation in order to allow maturing**

# Naval Champions Managing Disruptive Innovations

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- **Senior Military Champion manages political struggle that leads to:**
  - **New stable career paths for younger officers who are committed to the new way of warfighting**
    - **For example, Naval Aviation, Composite Warfare Commander (CWC)**

# Naval Champions Managing Sustaining Innovations

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- **Senior Military Champion establishes Sustaining Innovation Team**
- **No disguising of innovation**
- **Zealot**
- **Civilian intervention**

# Naval Champions Managing Sustaining Innovations

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# Naval Champions Managing Sustaining Innovations

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# Naval Champions Managing Sustaining Innovations

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- **Throttle of change: How**
  - Small group -- Yes
  - Disguising -- No
  - Zealot -- Yes
  - Support/Promote junior officers -- N/A



# Predictions for Championing Sustaining and Disruptive Innovations

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● Engine of change:	<u>Disruptive</u>	<u>Sustaining</u>
– Civilian intervention	No	Yes
– Inter-service rivalry	Yes	Yes
– Intra-service rivalry	Yes	Yes
● Throttle of change:		
– Small group	Yes	Yes
– Disguising	Yes	No
– Zealot	No	Yes
– Support/Promote junior officers	Yes	No

# Points to Ponder

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- Disruptive and sustaining constructs correlate to what Williamson Murray calls the “revolutionary” and “evolutionary” phenomena of innovation.
- 90 percent of innovations are sustaining in nature and most senior military leaders are adept at championing these innovations.
- 10 percent of innovations are disruptive in nature and most senior military leaders are not adept at championing these innovations.

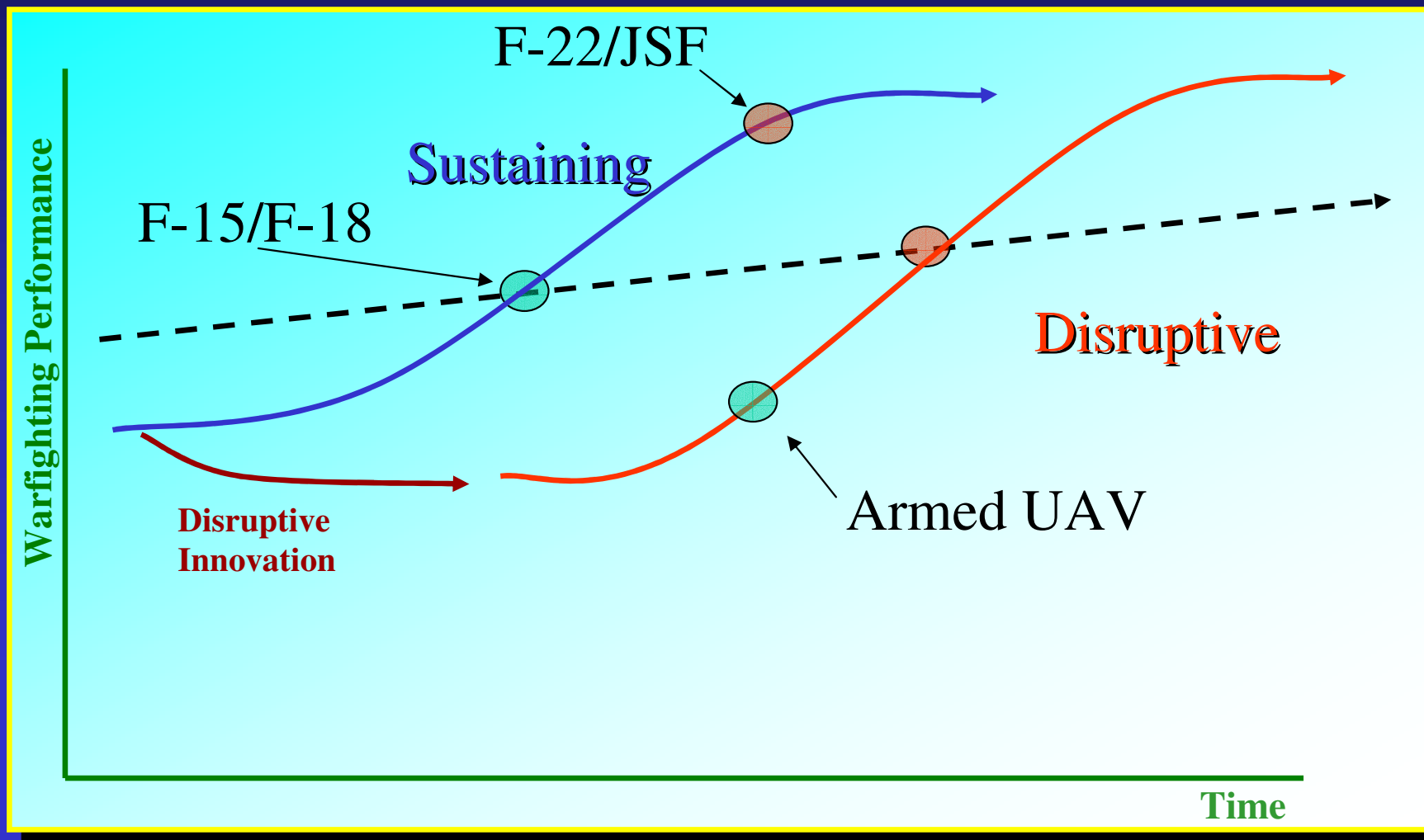
# Points to Ponder

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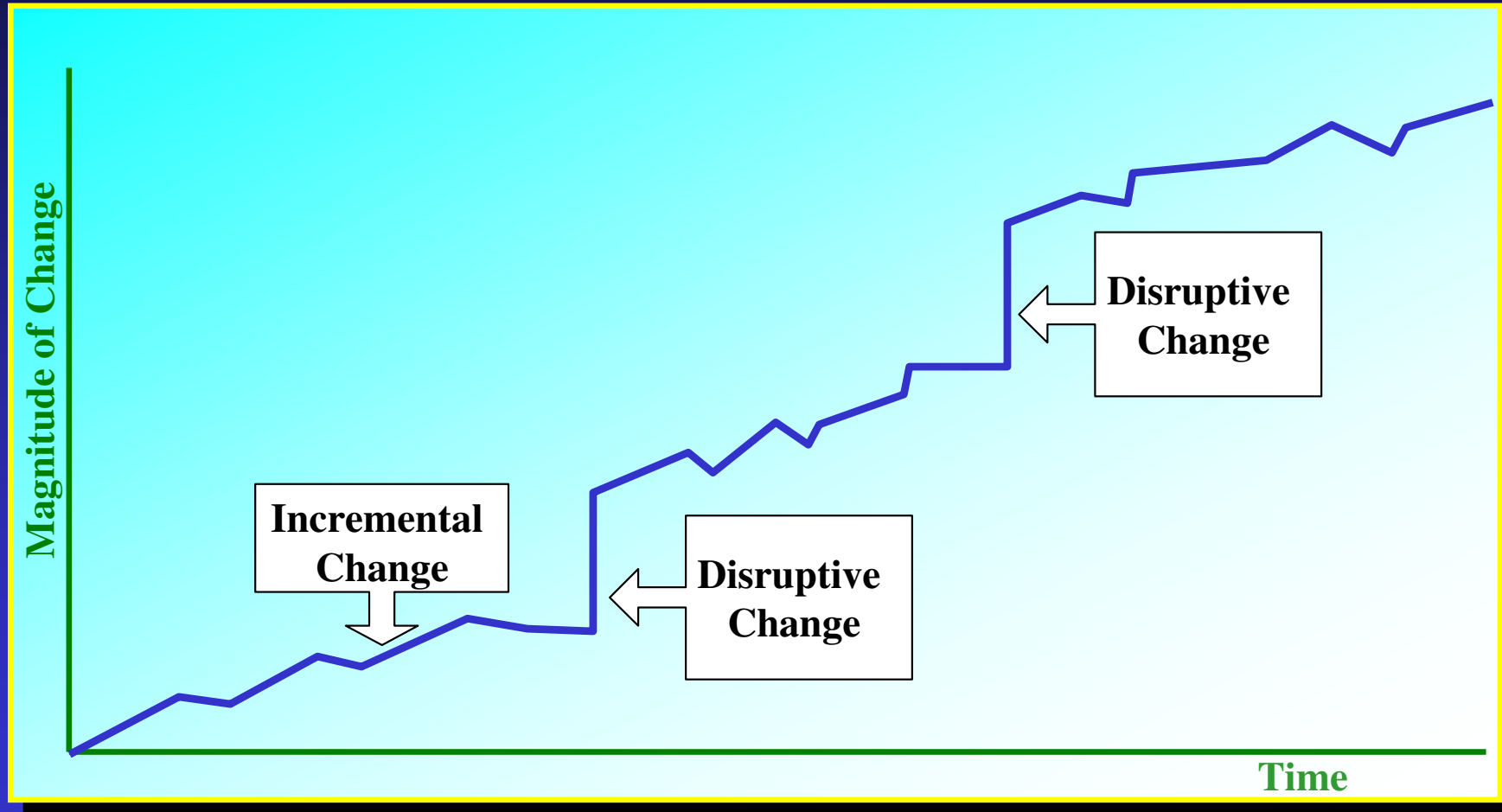
- Civilian leaders can help champion sustaining innovations but have failed to champion disruptive innovations.
- Disguising a disruptive innovation as a sustaining innovation is necessary but not sufficient for success.
- Small innovation groups are necessary but not sufficient for disruptive success.

# Points to Ponder

## Trajectory Overshoot Candidates?



# Warfighting Evolution: Periods of Sustaining Change Punctuated by Disruption Innovation

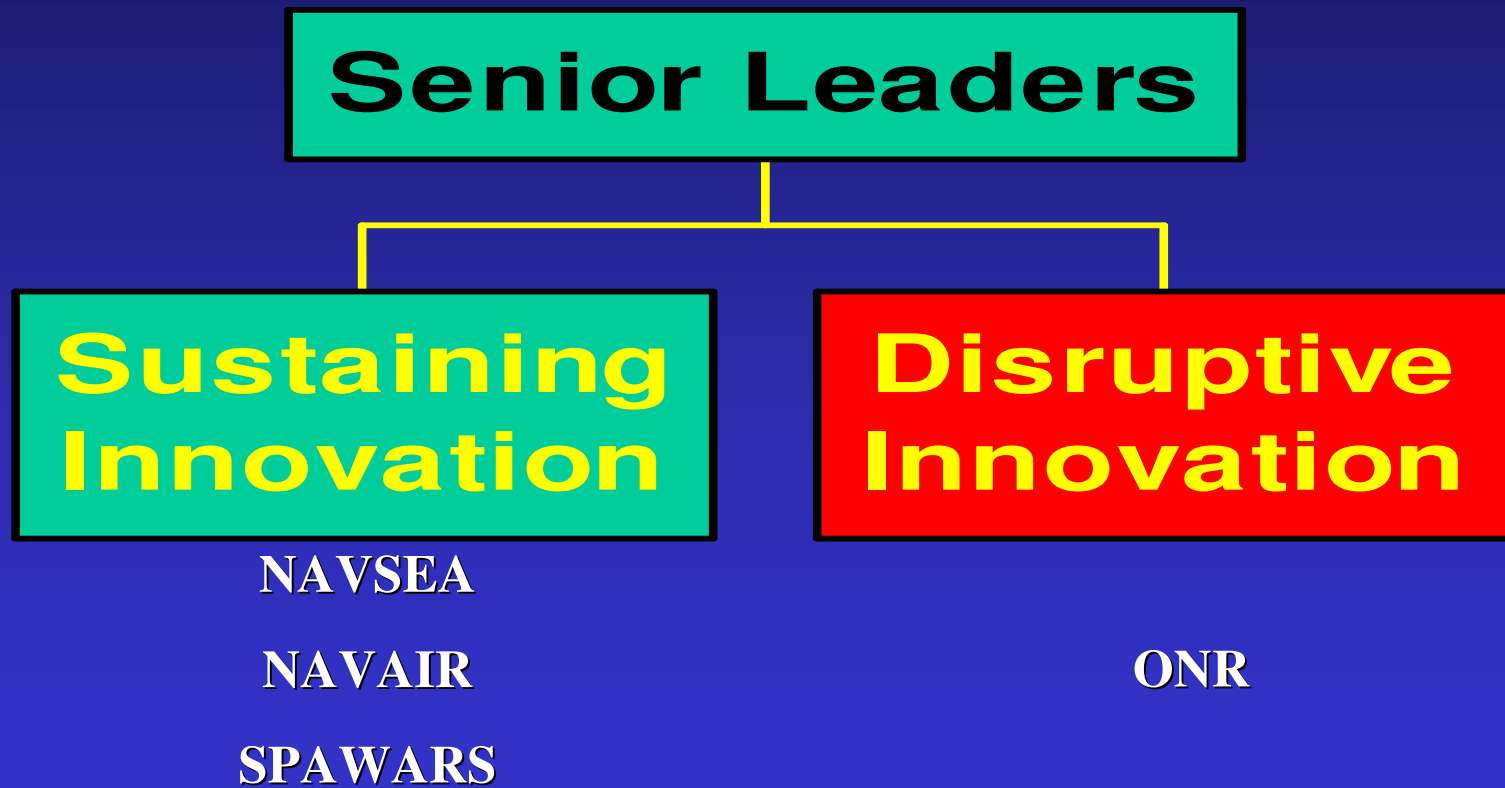


- Managing Disruptive Change Fundamentally Different from Managing Sustaining Change
- The Most Successful Senior Leader/Teams can Manage Both.

# Navy as Ambidextrous Organization:

Where Senior leaders simultaneously manage both sustaining and disruptive innovation for excelling today and tomorrow

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Result: Navy creates/manages streams of innovation (sustaining/disruptive change) over time.

# Questions?